BASIS FOR THE AMENDMENT

Claims 1-41 are active in the present application. Independent Claims 1 and 14 have been amended for clarity. Claims 21-41 are new claims. Support for new Claims 21-24, 35-36 and 40-41 is found in the paragraph bridging pages 10 and 11 of the specification. Support for new Claims 21-34 and 38-39 is found in the original claims. No new matter is added.

REQUEST FOR RECONSIDERATION

Applicants thank Examiner Wu and the Examiner's supervisor Mr. David Wu for the helpful and courteous discussion of August 3, 2005. During the discussion, Applicants' U.S. representative pointed out that abietic acid is not a peroxide. Applicants' representative further pointed out that the polymer latexes of the present invention are prepared in the presence of a peroxide, however they may be prepared under conditions at which the peroxide does not thermally decompose to generate radicals and therefore the peroxide recited in the present claims does not function as an initiator.

This aspect of the invention is disclosed in the paragraph bridging pages 10 and 11 of the specification wherein it is disclosed:

> [T]he peroxides used, in particular tert-butyl hydroperoxide and cumyl hydroperoxide, are not suitable, under the conditions described, for acting as an initiator in the polymerization. A separate initiator system, such as, for example, ammonium persulfate or sodium persulfate, is required for this purpose. Without the addition of an initiator, the polymerization would not function, which can serve as evidence that the peroxide used, in particular the tert-butyl hydroperoxide and a cumyl hydroperoxide, do not act as an initiator but as a molecular weight regulator under the polymerization conditions. Therefore, only peroxides which exhibit no thermal decomposition or only very little thermal decomposition at the present polymerization temperatures are suitable for use as regulators in the context of the present invention.

The Office asserted that the original claims are anticipated by a patent to Stollmaier (U.S. 5,837,762). Applicants traverse the Office's assertion on the grounds that original Claims 1 and 14 explicitly state that the peroxide is a chain transfer agent. The original claims do not state that the peroxide is an initiator. Applicants therefore submit that the composition and process of original Claims 1 and 14 inherently require that the polymer latex is prepared under conditions that do not thermally decompose the peroxide to generate radicals which act as an initiator in the polymerization of the monomers which make up the polymer.

Applicants submit that it is readily recognized that an organic peroxide reacts differently as a chain transfer reagent in comparison to its reaction as a radical initiator. Applicants submit herewith copies of pages 221-222 of P.A. Lovell and M.S. El-Aasser, "Emulsion Polymerization and Emulsion Polymers," Wiley, Chichester, 1997; Chapter 6 as evidence of the state of the art at the time of the filing of the present application. On page 221 (paragraph 6.5.1.1) it is stated that the use of peroxydisulfate salts as initiators in emulsion polymerizations leads to the formation of charged latex particles. It is further stated that peroxydisulfate initiators thermally decompose to initiate (e.g., begin) the polymerization reaction.

Applicants submit that it is readily recognized by those of ordinary skill in the art that hydrogen peroxide (e.g., organic hydroperoxides) may decompose in water to form hydroxi radicals which, in contrast to the peroxydisulfate salts, do not carry a charge. The latex particle obtained using a peroxydisulfate initiator has a charge whereas latex particles obtained from an organic peroxide such as a hydroperoxide do not have a charge. Thus, a peroxide acting as a chain transfer reagent may provide a charge particle whereas an organic peroxide acting only as an initiator provides an un-charged latex particle.

Moreover, Applicants submit that it is readily recognized by those of ordinary skill in the art that the decomposition of an organic peroxide (e.g., the decomposition of a compound of formula R-O-O-R to form two radicals of formula R-O) forms an alkoxy radical which may bind at the terminus of a forming polymer or may bind to the backbone of the forming polymer to provide an alkoxy-substituted polymer. In contrast, azo initiators, which have no oxygen atom, cannot form an alkoxy-substituted polymer. Likewise, persulfates do not form alkoxides.

Applicants draw the Office's attention to new dependent Claims 21-24, 35-36 and 40-41 wherein it is explicitly stated that the polymerization or preparation is carried out under

conditions that the peroxide is not thermally decomposed or that the peroxide does not act as an initiator.

Applicants submit that abietic acid is not a peroxide. Applicants point out to col. 2, lines 3-6 of Stollmaier has evidence that abietic acid is not a peroxide. The relevant disclosure of Stollmaier is reproduced below:

> The main components of gum rosin are a number of isomeric rosin acids, such as monocarboxylic acids of the alkyl hydrophenanthrene type (abietic acid) having a molecular formula $C_{20}H_{30}O_2$.

Therefore, in the prior art cited by the Office, it is explicitly disclosed that abietic acid is a monocarboxylic acid and not a peroxide. As further evidence that abietic acid is not a peroxide, Applicants submit herewith a chemical structure of abietic acid taken from www.aldrich.com on July 19, 2005. It is readily evident from the structure submitted herewith that abietic acid is not a peroxide or a hydroperoxide.

Applicants submit the amendment to the claims obviates the rejections under 35 U.S.C. § 112.

Applicants submit that the amendment to the claims and comments above are sufficient to place all now-pending claims in condition for allowance. Applicants respectfully request the withdrawal of the rejection and the passage of all now pending claims to allowance.

Respectfully submitted,

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Emulsion Polymerization and Emulsion Polymers

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calcium ions, etc. and replace them with hydrogen ion. This produces acids which are neutralized by anion exchange resins. The hydrogen ions from the cation resin combine with the hydroxide ions produced by the anion resin to form water. The water quality is usually monitored by measurement of resistivity. Water quality from 50 000 to 10 000 000 ohm-cm, which is equivalent to less than 0.05 mg dm^{-3} of sodium chloride, can be realized by suitable choice of resins and bed configurations, namely separate beds vs mixed beds [55]. Generally, the organic components in city water are not high enough for concern. The oxygen content, however, is because oxygen is a free-radical scavenger and in some systems will delay the start of polymerization. This can be avoided by deoxygenation of water. One popular method is sparging with nitrogen prior to polymerization.

6.5 Initiation

A source of free radicals are needed for water-borne emulsion polymerization. The free radicals can be produced by thermal decomposition of peroxy compounds like persulfate [56], or by redox reactions like the persulfate/bisulfite couple [57], or by γ-radiation [58,59]. The free-radical initiators can be either water or oil soluble, determining the preferred phase in which the free radicals will be produced.

6.5.1 Thermal initiators

6.5.1.1 Water-soluble initiators

The most frequently used initiators are the salts of peroxydisulfate, i.e. persulfates. The thermal decomposition yields sulfate radical anions, which contribute to the charged character of the latex particle. Sodium, potassium and ammonium salts are generally interchangeable and are used in the temperature range of 50–90 °C. The decomposition of persulfate is accelerated at acid pH; the acid catalysed decomposition does not yield free radicals. The thermal and acid catalysed reactions have activation energies of 138.9 and 108.8 kJ mol^{-1} respectively [60]. In the presence of some water-soluble organic species, such as alcohols [61], vinyl acetate monomer [62] and itaconic acid [63], the persulfate decomposition rate is increased with no apparent increase in free-radical production. In contrast to persulfate, hydrogen peroxide [64] decomposes in water to form hydroxyl radicals, which are not charged.

Water-soluble initiators are thought to form oligomeric radicals of varying length in the aqueous phase which are then adsorbed or captured by micelles or existing particles. Hydroperoxides are soluble in both the aqueous phase and in the monomer-swollen particles. The decomposition generates a hydroxyl and another oxygenated radical which could partition in either phase dependent on the type of hydroperoxide used. Cumene hydroperoxide in styrene polymerization

has been postulated to decompose in the particle interphase region, between monomer-swollen particle and water, and the hydroxyl radical enters the water phase and the non-polar radical diffuses into the particle [65]. Cationic initiators have not not been widely used. Cationic polystyrene particles with amidinium charged sites have, however, been reported [66].

6.5.1.2 Oil-soluble initiators

Oil-soluble initiators such as benzoyl peroxide, 2,2-azobis(isobutyronitrile) [67] are sometimes used [43]. They partition preferentially into the monomer-swollen particle and generate the free radical in that confined space. The expectation that free radicals generated within the particles would quickly annihilate each other was not experimentally observed when styrene was polymerized with 0.2% benzoyl peroxide. The competitive particle growth rates were the same as in the presence of water-soluble initiators [68].

6.5.2 Redox initiators

The combination of certain oxidizing and reducing agents will produce free radicals even at low temperatures. This can be particularly useful when high molar mass polymers are sought with low levels of branching. Common redox systems are: persulfate-bisulfite [57,66] and persulfate-hydrosulfite [69,70]. Sodium formaldehyde sulfoxylate has been used with a wide number of oxidizing agents like cumene hydroperoxide [71], *tert*-butyl hydroperoxide [72] and diisopropylbenzene hydroperoxide [73]. The persulfate/iron(II) redox pair has been long known [74] and in practically all of the above redox systems iron(II) is used as a "co-catalyst". Systems of oil-soluble/water-soluble pairs include: *tert*-butyl hydroperoxide-erythrobic acid and benzoyl peroxide-iron(II) [75]. Combinations of reducing agents have also been explored, and for example, persulfate-pyrosulfite-thiosulfate with copper sulfate co-catalyst at near neutral pH was the most effective found for vinyl acetate [76].

6.6 Surfactants

Surfactants are a key formulation variable in emulsion polymerizations. According to Dunn [77] surfactants can:

1. Act to stabilize the monomer droplets in an emulsion form (i.e., the droplets act as a reservoir to supply the growing polymer particles with additional monomer, or can act as the locus of polymerization if the monomer emulsions are comparable in size to monomer-swollen micelles, as in the case of miniemulsion polymerization (see Chapter 20)).

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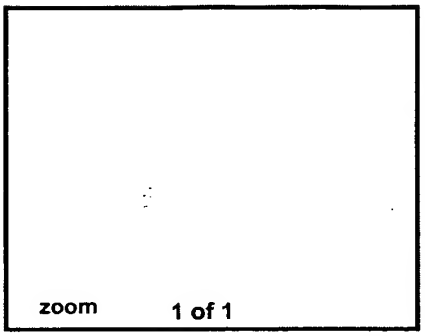

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Molecular Weight	302.45
CAS Number	514-10-3
Beilstein Registry Number	2221451
EG/EC Number	2081783
MDL number	MFCD03423567

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Product Number	Your Price USD	Available to Ship		Quantity	Actions
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A9424-100G	138.50	07/19/2005	details...		

Descriptions

Packaging 25, 100 g

Properties

mp 139-142 °C (lit.)

References

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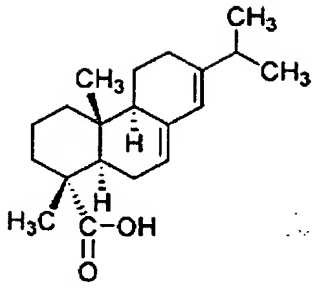

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